KS54AHCT 74 / KS74AHCT 74

Dual D-Type Positive-Edge-Triggered Flip-Flops with Preset and Clear

FEATURES

- Function, pin-out, speed and drive compatibility with 54/74ALS logic family
- Low power consumption characteristic of CMOS
- High-Drive-Current outputs: I_{OL} = 8 mA @ V_{OL} = 0.5V
- Inputs and outputs interface directly with TTL, NMOS and CMOS devices
- Wide operating voltage range: 4.5V to 5.5V
- Characterized for operation over industrial and military temperature ranges:
  KS74AHCT: −40°C to +85°C
  KS54AHCT: −55°C to +125°C
- Package options include plastic "small outline" packages, standard plastic and ceramic 300-mil DIPs

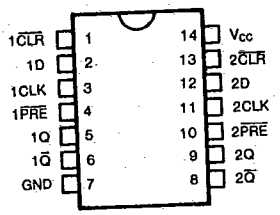
DESCRIPTION

These devices contain two independent positive-edge-triggered D-type flip-flops. Each flip-flop has its own data, clock, preset and clear inputs and complementary Q and $\overline{Q}$ outputs. The preset and clear inputs are active-low and operate independently of the clock. Data at the D input is transferred to the Q outputs on the positive transition of the clock, provided setup requirements have been met.

These devices provide speeds and drive capability equivalent to their ALSTTL counterparts and yet maintain CMOS power levels. The input and output voltage levels allow direct interface with TTL, NMOS and CMOS devices without any external components.

All inputs and outputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

PIN CONFIGURATION

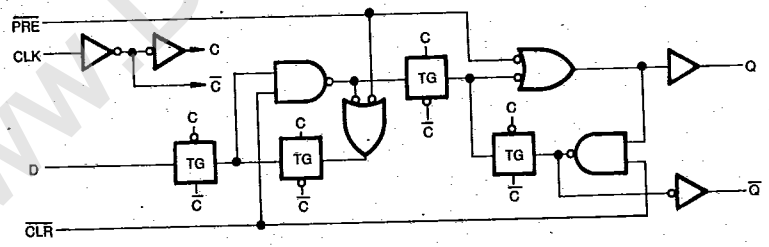


FUNCTION TABLE

Inputs				Outputs	
$\overline{PRE}$	$\overline{CLR}$	CLK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H*	H*
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	No Change	
H	H	H	X	No Change	
H	H	↓	X	No Change	

*Both outputs will remain high as long as $\overline{PRE}$ and $\overline{CLR}$ are low, but the output states are unpredictable if $\overline{PRE}$ and $\overline{CLR}$ go high simultaneously.

LOGIC DIAGRAM



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Absolute Maximum Ratings*

Supply Voltage Range V_{CC} . . . . . −0.5V to +7V
DC Input Diode Current, I_{IK}
($V_I < -0.5V$ or $V_I > V_{CC} + 0.5V$) . . . . ±20 mA
DC Output Diode Current, I_{OK}
($V_O < -0.5V$ or $V_O > V_{CC} + 0.5V$) . . . . ±20 mA
Continuous Output Current Per Pin, I_O
($-0.5V < V_O < V_{CC} + 0.5V$) . . . . . ±35 mA
Continuous Current Through
V_{CC} or GND pins . . . . . ±125 mA
Storage Temperature Range, T_{stg} . . . −65°C to +150°C
Power Dissipation Per Package, P_d† . . . . . 500 mW

* Absolute Maximum Ratings are those values beyond which permanent damage to the device may occur. These are stress ratings only and functional operation of the device at or beyond them is not implied. Long exposure to these conditions may affect device reliability.

† Power Dissipation temperature derating:
Plastic Package (N): −12mW/°C from 65°C to 85°C
Ceramic Package (J): −12mW/°C from 100°C to 125°C

Recommended Operating Conditions

Supply Voltage, V_{CC} . . . . . 4.5V to 5.5V
DC Input & Output Voltages*, V_{IN}, V_{OUT} . . 0V to V_{CC}
Operating Temperature
Range KS74AHCT: −40°C to +85°C
KS54AHCT: −55°C to +125°C
Input Rise & Fall Times, t_r, t_f . . . . . Max 500 ns

* Unused inputs must always be tied to an appropriate logic voltage level (either V_{CC} or GND)

DC ELECTRICAL CHARACTERISTICS (V_{CC}=5V±10% Unless Otherwise Specified)

Characteristic	Symbol	Test Conditions	T_a=25°C	KS74AHCT T_a=−40°C to +85°C	KS54AHCT T_a=−55°C to +125°C	Unit
			Typ	Guaranteed Limits		
Minimum High-Level Input Voltage	V_{IH}			2.0	2.0	2.0	V
Maximum Low-Level Input Voltage	V_{IL}			0.8	0.8	0.8	V
Minimum High-Level Output Voltage	V_{OH}	V_{IN}=V_{IH} or V_{IL} I_O=−20μA I_O=−4mA	V_{CC} 4.2	V_{CC} −0.1 3.98	V_{CC} −0.1 3.84	V_{CC} −0.1 3.7	V
Maximum Low-Level Output Voltage	V_{OL}	V_{IN}=V_{IH} or V_{IL} I_O=20μA I_O=4mA I_O=8mA	0	0.1 0.26 0.39	0.1 0.33 0.5	0.1 0.4	V
Maximum Input Current	I_{IN}	V_{IN}=V_{CC} or GND		±0.1	±1.0	±1.0	μA
Maximum Quiescent Supply Current	I_{CC}	V_{IN}=V_{CC} or GND I_{OUT}=0μA		4.0	40.0	80.0	μA
Additional Worst Case Supply Current	ΔI_{CC}	per input pin V_I=2.4V other Inputs: at V_{CC} or GND I_{OUT}=0μA		2.7	2.9	3.0	mA

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AC ELECTRICAL CHARACTERISTICS (Input t_r, $t_f \leq 2$ ns), AHCT74

Characteristic		Symbol	Conditions†	$T_a=25°C$ $V_{CC}=5.0V$	KS74AHCT $T_a=-40°C$ to $+85°C$ $V_{CC}=5.0V \pm 10\%$		KS54AHCT $T_a=-55°C$ to $+125°C$ $V_{CC}=5.0V \pm 10\%$		Unit
				Typ	Min	Max	Min	Max	
Maximum Clock Frequency		f_{max}	$C_L=50pF$	55	34		30		MHz
Propagation Delay, CLK to Q or $\overline{Q}$		t_{PLH}		10		17		20	ns
		t_{PHL}		10		17		20	
Propagation Delay, $\overline{PRE}$ or $\overline{CLR}$ to Q or $\overline{Q}$		t_{PLH}		9		15		18	ns
		t_{PHL}		9		15		18	
Setup Time before CLK†	Data	t_{su}		7	12		15		ns
	$\overline{PRE}$ or $\overline{CLR}$ Inactive			5	8		10		
Hold Time, Data after CLK†		t_h		−3	0		0		ns
Pulse Width	CLK High or Low	t_w		9	15		17		ns
	$\overline{PRE}$ or $\overline{CLR}$ Low			9	15		17		
Input Capacitance		C_{IN}		5					pF
Power Dissipation Capacitance*		C_{PD}							pF

* C_{PD} determines the no-load dynamic power dissipation: $P_D=C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$.
† For AC switching test circuits and timing waveforms see section 2.

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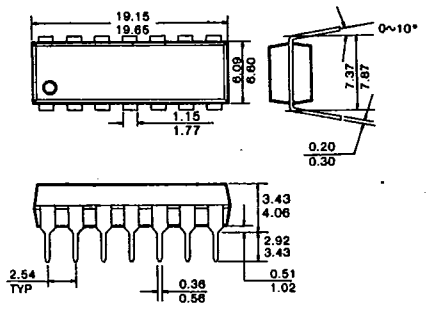
PACKAGE DIMENSIONS

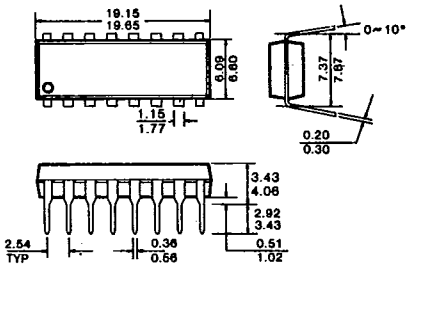
T-90-20

1. PLASTIC PACKAGES

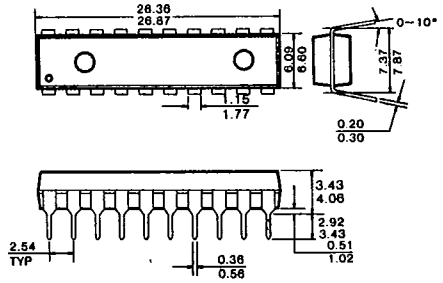
14-Pin Plastic DIP **Units: mm**



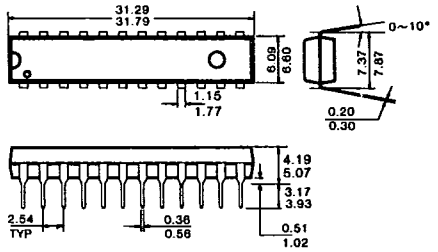
16-Pin Plastic DIP **Units: mm**



20-Pin Plastic DIP **Units: mm**



24-Pin Plastic DIP **Units: mm**



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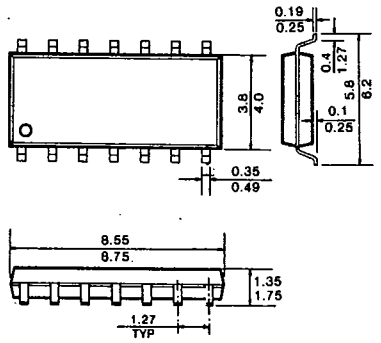
PACKAGE DIMENSIONS

T-90-20

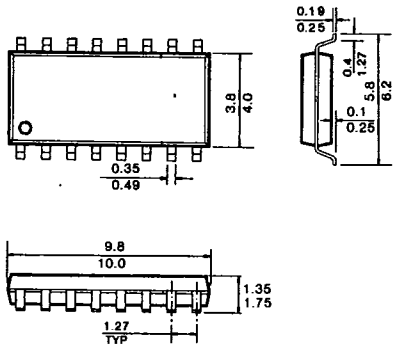
14-Pin SOP

Unit: mm



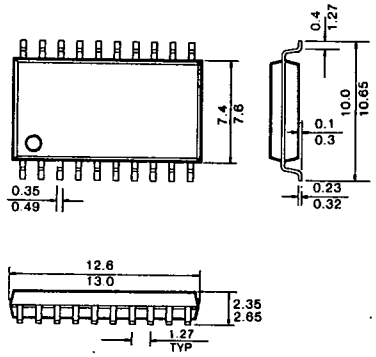
16-Pin SOP

Unit: mm



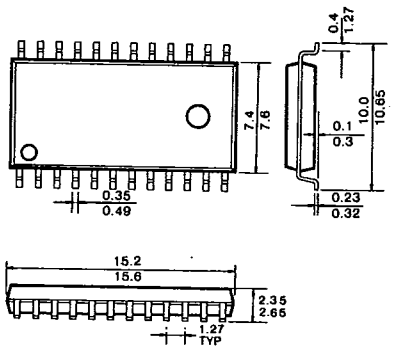
20-Pin SOP

Unit: mm



24-Pin SOP

Unit: mm

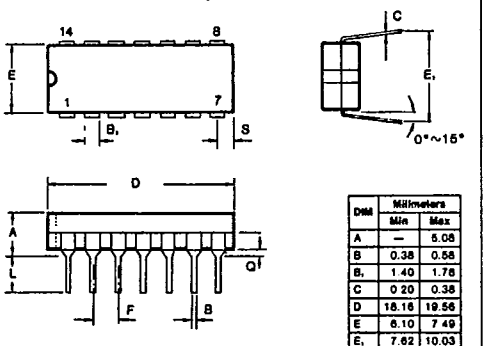


PACKAGE DIMENSIONS

T-90-20

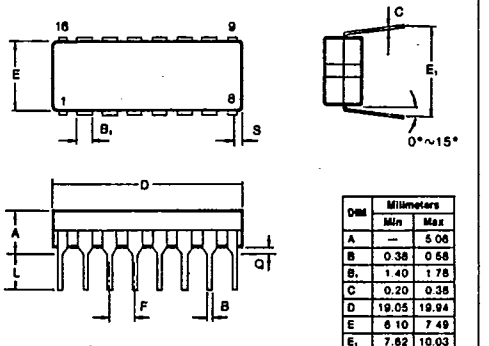
2. CERAMIC PACKAGES

14-Pin Ceramic DIP Units: mm



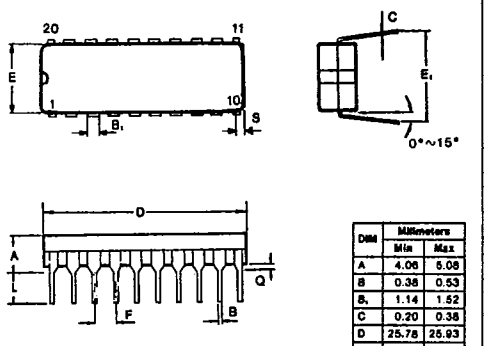
DIM	Millimeters	
	Min	Max
A	—	5.08
B	0.38	0.58
B1	1.40	1.78
C	0.20	0.38
D	18.16	19.56
E	6.10	7.49
E1	7.62	10.03
F	2.54	
L	3.16	4.19
Q	0.51	1.02
S	1.91	2.29

16-Pin Ceramic DIP Units: mm



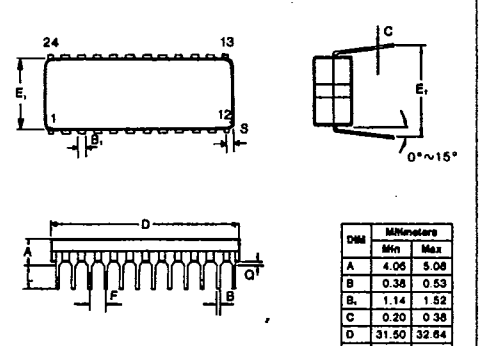
DIM	Millimeters	
	Min	Max
A	—	5.08
B	0.38	0.58
B1	1.40	1.78
C	0.20	0.38
D	19.05	19.94
E	6.10	7.49
E1	7.62	10.03
F	2.54	
L	3.16	4.19
Q	0.51	1.02
S	0.51	1.14

20-Pin Ceramic DIP Units: mm



DIM	Millimeters	
	Min	Max
A	4.06	5.08
B	0.38	0.53
B1	1.14	1.52
C	0.20	0.38
D	25.78	25.93
E	6.10	6.60
E1	7.77	7.98
F	2.54	
L	3.73	4.01
Q	0.38	0.89
S	0.51	1.14

24-Pin Ceramic DIP Units: mm



DIM	Millimeters	
	Min	Max
A	4.06	5.08
B	0.38	0.53
B1	1.14	1.52
C	0.20	0.38
D	31.50	32.64
E	7.24	7.75
E1	7.77	7.98
F	2.54	
L	3.73	4.01
Q	0.508	1.778
S	1.65	1.93

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